ENGINE THROTTLE with DISPLAY and MONITORING SYSTEM
MODEL: ELA200

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INTRODUCTION

Overview

The ThrottleXcel is an all-in-one instrument panel that integrates a traditional style remote hand throttle with engine monitoring and display. It provides engine control as a remote throttle or it can be programmed as an engine governor.

The ELA200 models are programmed to operate in one of the following control modes dependent on requirements, engine type, and wiring.

**Throttle Control Mode:** In this mode the ThrottleXcel is a traditional remote engine hand throttle and provides manual control of the engine RPM.

**Governor Control Mode:** In this mode the ThrottleXcel is an engine governor and maintains a constant engine RPM. It eliminates the need to make throttle adjustments as the engine load changes.

RPM adjustments are made in both modes by turning the control knob. The engine can be brought down to idle quickly after operation with the touch of the red idle button.

The four LED bar graphs provide constant display of safe operating ranges for engine oil pressure, engine coolant temperature, transmission temperature, and battery voltage. They do not show exact numbers or units of measure. Detailed information is shown in the message display when the MENU button is pressed. Engine hours are also shown.

All controls and indicators are located on the front of the control module.

Features

- J1939 CAN Bus for Engine Information
- Manual or Automatic Control of Engine RPM
- Powers Up at Engine Idle RPM
- Interlock Signal Recognition with Throttle Ready LED
- Return to Engine Idle With the Push of a Button
- Diagnostic Capabilities
- High Idle
- Displays and LEDs Automatically Adjusted for Day or Night Operation
- Audible Alarm Buzzer (Optional)
- KPa / Bar (Optional)
Specifications

The ThrottleXcel is available in various models. Each model is programmed to interface with specific engines. All models provide the same functions, controls, and digital readouts.

Display Module

Supply Power: 12/24 VDC
Supply Current: 0.5 Amps
Dimensions: 4 5/8" Wide by 6 3/4" High

LED Bar Graphs

Oil Pressure: 10 - 100 PSI
Temperature (Engine Coolant): 150 - 240 °F
Transmission Temperature: 140 - 300 °F
Battery Voltage: 11.5 - 16 VDC (12 V)
23.0 - 30 VDC (24 V)

Engine Sensors (as necessary)

Engine Oil Pressure: 0 - 100 PSI, 1/8" NPTF
Engine Coolant Temperature: 100 - 250 °F, 1/2" - 14 NPT
Transmission Temperature: 140 - 320 °F, 1/8" NPTF

Audible Alarm Buzzer (Optional)

Voltage: 12/24 VDC
Volume: 96 dB
GENERAL DESCRIPTION

The ThrottleXcel model ELA200 provides a remote throttle for engine RPM control and displays for remote engine monitoring, these models are not engine governors. The ThrottleXcel is compatible with the following engines:

ELA201 Cummins IS Series
ELA202 Detroit Diesel
ELA204 Navistar
ELA205 Caterpillar
ELA206* Ford (Governor Control Mode Not Available)
ELA207 Mack (Governor Control Mode Not Available)
ELA208 Scania
ELA210 Mercedes
ELA216 John Deere
ELA224 MAN

* Note: An adapter and cable assembly replaces the basic 8-pin cable when connecting the ThrottleXcel to a Ford (except 2011) engine.

Components

The information available on the J1939 databus varies depending on the particular engine type. Not all wires are used for all engines. Refer to the engine specific wiring diagram for interface connections. The sensors (if any) that need to be installed also vary depending on the engine.

The ThrottleXcel consist of the following components:

Control Module

Engine Oil Pressure Sensor (As Necessary)
Engine Coolant Temperature Sensor (As Necessary)
Transmission Temperature Sensor (As Necessary)
Audible Alarm Buzzer (Optional)

Cables

Control Module

The control module is waterproof and uses 4 5/8 by 6 3/4 inches of panel space. All controls and indicators are located on the front of the control panel. (Refer to Controls and Indicators.)
Engine Oil Pressure Sensor

The oil pressure sensor is installed as necessary.

Engine Coolant Temperature Sensor

The engine coolant temperature sensor is installed as necessary.

Transmission Temperature Sensor

The transmission fluid temperature sensor is installed as necessary.

Audible Alarm Buzzer (Optional)

The optional buzzer is installed as required. A ground is provided at the 12-pin connector pin 6 to activate the buzzer (max current: 300mA).

Cables

There are three cables that connect to the control module. The 8-pin connector is for the remote throttle interface, the 12-pin connector is for the monitoring and display interface. The 6-pin connector is for the FRC datalink.
Controls and Indicators

All controls and indicators are located on the front of the control module. (Refer to Figure 1.) The displays and LEDs are automatically adjusted for day or night operation. See Operation and Programming Sections for more information.

**MENU Button**

Used to access stored data and program features.

**Oil Pressure LED Display**

Shows engine oil pressure. The LEDs are green when the pressure is within normal limits and red when it is not.

**CHECK ENGINE LED, STOP ENGINE LED**

Repeats the warnings from the cab.

**Engine Temperature LED Display**

Shows engine coolant temperature. The LEDs are green when the temperature is within normal limits and red when it is not.

**Transmission Temperature LED Display**

Shows transmission temperature. The LEDs are green when the temperature is within normal limits and red when it is not.

**RPM Display**

Shows the current engine RPM in bright red digits. It also shows error codes, stored data, and program features.

**Battery Voltage LED Display**

Shows battery voltage. The LEDs are green when the voltage is within normal limits and red when it is not.

**SILENCE Button**

Press to suppress audio alarms. Used during programming modes.

**THROTTLE READY LED**

This LED is on when the required interlock conditions are met to begin operations.
Message Display

The message display shows **THROTTLE ACTIVE** (or RPM setting if in governor control mode) during normal operations and warning alarms as they occur. It shows the time and date when the throttle ready LED is off. It also shows stored data and program features.

**IDLE Button**

When pressed immediately sets the engine RPM to idle.

**Control Knob**

When rotated changes the RPM. The RPM increases or decreases proportionally to the speed and direction the control knob is rotated.

**SCROLL Buttons**

Used during programming modes.
INSTALLATION

Install Control Module

1. Measure and mark mounting location for control module panel cutout and mounting screw holes. Make sure there is clearance behind the panel for the module and cables before cutting holes. Refer to Figure 2 for layout and dimensions.

2. Cut out a 3 1/2 by 5 3/4 inch hole.

3. Drill four holes, clearance or tapped, for 10-32 mounting screws.

4. Place control module in position and secure with screws.

5. Connect cables at rear of the control module. (Refer to Wiring Section.)

Install Engine Sensors

For most engines, the engine throttle display receives engine RPM, oil pressure, engine coolant temperature, and transmission temperature data over the J1939 databus. Some engines do not broadcast this data over the databus and sensors may need to be installed.

Note: The ThrottleXcel may need a programming change for some sensor inputs to be recognized. If the sensor was not ordered as part of the ThrottleXcel kit you may need to contact FRC technical support for programming information.

The sensors are wired to the 12-pin connector at the rear of the control module. Refer to the Wiring Section.

Install Buzzer

Pin 6 on the 12-pin connector at the rear of the control module is provided to connect an optional buzzer. Connect the ground side of the buzzer to pin 6. Maximum current through pin 6 is 300 mA. The buzzer ordered from FRC requires a 1-1/8 inch diameter mounting hole. (Refer to the Wiring section.)

Install High Idle Kit

The high idle is activated when + VDC is provided to pin 7 (High Idle Active Input) of the 12-pin connector and pin 6 (Interlock Input) of the 8-pin connector. Refer to High Idle Wiring.

Note: It is important that the connection to the Interlock Input from the High Idle circuit be isolated from the apparatus interlock wiring with the two diodes. The pump must NOT be engaged when using the high idle function and the THROTTLE READY LED will be off.
Figure 2. Control Module Mounting Dimensions

Mounting holes are clearance or tapped for 10-32 screws.
OPERATION

The ELA200 models are programmed to operate in one of the following control modes dependent on requirements, engine type, and wiring.

Throttle Control Mode

This is the factory default. In this mode the ThrottleXcel is a traditional remote engine hand throttle and provides manual control of the engine RPM. Set the control knob for a specific RPM, as the engine load changes the engine RPM may change. Changes in the ThrottleXcel output to adjust the engine RPM are made manually by turning the control knob.

The message display shows THROTTLE ACTIVE.

Governor Control Mode

This mode is programmed at installation. In this mode the ThrottleXcel is an engine governor and maintains a constant engine RPM. It eliminates the need to make throttle adjustments as the engine load changes. Set the control knob for a specific RPM, as the engine load varies the engine RPM remains the same. Changes in the ThrottleXcel output to adjust the engine RPM are made automatically and hold engine speed at the RPM setting. (Changes to the RPM setting are made by turning the control knob.)

The message display shows the RPM setting in the form: RPM 1100.

Power-up

Note: When power is applied to the ThrottleXcel the message display shows the Software Program Revision Number for five (5) seconds and then the Control Mode for two (2) seconds.

On power-up the RPM display shows engine RPM, the four LED bar graphs are green indicating readings within normal ranges, and the message display alternates between showing the date and time.

If a monitored function is not within normal parameters the display flashes, the RPM display shows an error or fault warning code and a description shows in the message display. (Refer to Table 1. Error Codes or Table 2. Fault Warning Codes.)

If one of the inputs displayed by the LED bar graphs is not within normal range the LEDs will be red.

When all necessary throttle enables are active and the interlock circuit is complete, the THROTTLE READY LED comes on and the remote throttle is ready to control the engine RPM. The control signal is set at idle regardless of the control knob position.

RPM adjustments are made in both modes by turning the control knob. The engine can be brought down to idle quickly after operation with the touch of the red idle button.
Controls

Control Knob

The control knob is used to adjust the engine RPM (or RPM setting). ThrottleXcel senses how fast and in what direction the control knob is rotated and sends a signal to the ECM to increase or decrease the engine RPM proportionally.

If the control knob is rotated quickly; the engine RPM changes quickly.

If the control knob is rotated slowly; the engine RPM changes slowly.

• Rotate the control knob clockwise to increase engine RPM.
• Rotate the control knob counterclockwise to decrease engine RPM.
• Press the red IDLE button to immediately return the engine to idle.

Table 1. Error Codes

<table>
<thead>
<tr>
<th>RPM Display</th>
<th>Message Display</th>
<th>Probable Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Note: Not all inputs are used for all engines. For systems that use a datalink to pass information the datalink cable and connectors or ECM programming would be the probable cause.</td>
</tr>
<tr>
<td>E01</td>
<td>NO DATA</td>
<td>&gt;Datalink cable not connected / connected to wrong port</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;Broken wire / bad connector contact on datalink cable</td>
</tr>
<tr>
<td>E02</td>
<td>NO RPM</td>
<td>Engine RPM not detected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;Datalink cable not connected / connected to wrong port</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;Engine not running / ignition key on</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;Broken wire / bad connector contact on alternator cable</td>
</tr>
<tr>
<td>E04</td>
<td>NO OIL SENSOR</td>
<td>No Engine Oil Pressure Data Detected (w/separate sensor input)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;Sensor cable not connected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;Broken wire / bad connector contact on sensor cable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;Defective pressure sensor</td>
</tr>
<tr>
<td>E07</td>
<td>NO ENG T SENSOR</td>
<td>No Coolant Temperature Data Detected (w/separate sensor input)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;Sensor cable not connected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;Broken wire / bad connector contact on sensor cable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;Defective temperature sensor</td>
</tr>
<tr>
<td>E16</td>
<td>NO FRC DATALINK</td>
<td>&gt;FRC datalink cable not connected / connected to wrong port</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;Broken wire / bad connector contact on cable</td>
</tr>
</tbody>
</table>

Table 2. Fault Warning Codes

<table>
<thead>
<tr>
<th>RPM Display</th>
<th>Message Display</th>
<th>Description</th>
<th>Factory Default Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>F01</td>
<td>HI BATT VOLTAGE</td>
<td>High Battery Voltage</td>
<td>15.5 V</td>
</tr>
<tr>
<td>F02</td>
<td>LOW BATT VOLTAGE</td>
<td>Low Battery Voltage</td>
<td>11.8 V*</td>
</tr>
<tr>
<td>F03</td>
<td>HI TRANS TEMP</td>
<td>High Transmission Temperature</td>
<td>300 °F</td>
</tr>
<tr>
<td>F04</td>
<td>LOW OIL PRESSURE</td>
<td>Low Engine Oil Pressure</td>
<td>8 PSI**</td>
</tr>
<tr>
<td>F07</td>
<td>HI ENG TEMP</td>
<td>High Engine Coolant Temperature</td>
<td>220 °F**</td>
</tr>
<tr>
<td>F09</td>
<td>ENG NOT RESPOND</td>
<td>Engine Does Not Respond</td>
<td></td>
</tr>
</tbody>
</table>

* 11.8 engine running, 11.7 engine off.
** J1939 compliant—engine ECM will issue this warning.
Detailed Information

The four LED bar graphs provide constant display of safe operating ranges for engine oil pressure, engine coolant temperature, transmission temperature, and battery voltage. They do not show exact numbers or units of measure. This detailed information is shown in the message display when the MENU button is pressed. Engine hours are also shown.

Show Detailed Information

Note: Detailed information is a display only mode and no changes can be made to the data.

The MENU button allows the operator to gain access to detailed information. Each time the MENU button is pressed the display scrolls to show the next value.

The message display indicates the following:

- ENG TEMP  ### °F  (programmable for °C)
- ENG OIL  ### PSI  (programmable for kPa or Bar)
- BATT VDC  ##.# V  (programmable for 12V or 24V)
- ENG HRS  ####
- TRANS T.  ### °F  (programmable for °C)

The message display reverts to normal operation after 20 seconds if no buttons are pressed. When a button other than the MENU button is pressed, the display immediately reverts to normal operation. The SILENCE button should be used during operations.
High-Idle

The throttle programming includes a high-idle function. To activate the high-idle set all interlocks as called for by local SOP (normally this would include the transmission in neutral and the parking brake on). Set the High-Idle switch to ON.

**Note:** The pump must NOT be engaged when using the high-idle function and the THROTTLE READY LED will be off.

**Change High-Idle Setting**

**Note:** The high-idle is set at about 1000 RPM at the factory. (This value varies depending on the specific engine.)

1. With the engine running, set the high-idle switch to ON.
   
   Result: Engine goes to High-Idle RPM.

2. Press and hold IDLE button for 3 seconds.
   
   Result: RPM display flashes and shows the high-idle setting.

3. Keep pressing the IDLE button and rotate control knob to desired RPM.

4. Release IDLE button to store the new high idle setting.
PROGRAMMING

The following program functions are always available to view and change:
P101 - Software Program Revision Number - Read Only
P102 - Product Manufacturing Date - Read Only
P103 - Set Current Date - Read/Write
P104 - Set Current Time - Read/Write
P105 - Retrieve Fault Codes - Read Only
P106 - Engine Type Code - Read Only

Access Program Features

Note: When the program (P) code is flashing in the RPM display, press the SCROLL up or down button to scroll through the P-codes or press the SILENCE button to exit the programming mode.

1. Press the SILENCE button and hold it until the RPM display shows four dashes – – – – and the message display shows ENTER--- CODE. Release the button.
   Result: P 1 0 1 flashes in the RPM display. The message display shows the program revision number PROG REV V500.03.

2. Press the SCROLL up button.
   Result: P 1 0 2 flashes in the RPM display. The message display shows the manufacturing date MFG DATE 16JAN'15 (ddmmm'yy).

3. Press the SCROLL up button.
   Result: P 1 0 3 flashes in the RPM display. The message display shows the current date SET DATE 16JAN'15.

4. To Change the Date: (If not, go to step 5.)
   a. Press the MENU button.
      Result: P 1 0 3 stops flashing. The message display shows the current date with the year flashing.
   b. Press the SCROLL up or down button to change the year.
   c. Press the MENU button.
      Result: The month flashes.
   d. Press the SCROLL up or down button to change the month.
   e. Press the MENU button.
      Result: The day flashes.
   f. Press the SCROLL up or down button to change the day.
   g. Press and hold the SILENCE button to store the new date.
      Result: P 1 0 4 flashes in the RPM display. The message display shows SET TIME 10:30AM. Go to step 6.
5. Press the SCROLL up button.

   Result: P 1 0 4 flashes in the RPM display. The message display shows SET TIME 10:30AM.

6. To Change the Time: (If not, go to step 7.)
   a. Press the MENU button.
      Result: P 1 0 4 stops flashing. The message display shows the current time with the AM or PM flashing.
   b. Press the SCROLL up or down button to change AM or PM.
   c. Press the MENU button.
      Result: The minute flashes.
   d. Press the SCROLL up or down button to change the minutes.
   e. Press the MENU button.
      Result: The hour flashes.
   f. Press the SCROLL up or down button to change the hours.
   g. Press and hold the SILENCE button to store new time.
      Result: P 1 0 5 flashes in the RPM display. The message display shows NO WARNING or LOGGED DATA. Go to step 8.

7. Press the SCROLL up button.

   Result: P 1 0 5 flashes in the RPM display. The message display shows NO WARNING or LOGGED DATA.

8. Press the MENU button when it shows LOGGED DATA or go to step 9.

   Result: 5 1 flashes in the RPM display. The fault, date, and time that the fault code was recorded shows in the message display.
   a. To scroll through the logged fault code data, press the SCROLL up or down button.
   b. Press the SILENCE button to exit viewing logged data.

9. Press the SCROLL up or down button.

   Result: P 1 0 6 flashes in the RPM display. The message display shows the engine type code that is set in the program. (Refer to the Engine Code Reference Table.)

10. Press the SCROLL up or down button to scroll through the P-codes or press the SILENCE button to exit the programming mode.
Access Password Protected Programs

The following program functions are available to view and change after the password code has been entered:

Calibration Password Code 1111

C3 - Engine RPM Calibration
Refer to Calibration Section.

Enter Password Code

Note: To exit the programming mode, press the SILENCE button when the program code flashes in the RPM display.

1. Press the SILENCE button and hold it until the RPM display shows four dashes —— and the message display shows ENTER--- CODE. Release the button.

2. Press the MENU button within three seconds. The message display shows CODE ENTRY. The RPM display shows the number 1000. Each time the MENU button is pressed the first digit increments by 1. Set the first digit to the desired number.

3. Press the SILENCE button to move the cursor to the next digit. Press the MENU button to change the digit.

4. Repeat step 3 and enter the password code. (Calibration password is 1111.) Result: When a correct password code is entered C 3 for calibration or P 3 x x flashes in the RPM display.

5. Press the SCROLL up or down button when the program code is flashing to scroll through the program codes.

6. Press the MENU button to enter the programming mode to view and change parameter settings.

   Result: The program code stops flashing. The message display shows a selectable option or a numerical value.

7. Press the MENU button to change a selectable option or the SCROLL up or down button to change a numerical value.

8. Press the SILENCE button to save the changes and exit the programming mode.

   Result: The program code advances to the next code and flashes.

9. Repeat steps 5 through 8 as necessary.

10. Press the SILENCE button when the program code is flashing to exit.
CALIBRATION

Three programs are available after the calibration password code has been entered:
C3 - Engine RPM Calibration
Refer to Table 5. Calibration Codes Quick Reference Chart.

Enter Calibration Password Code 1111

Note: To exit the programming mode, press the SILENCE button when the program code flashes in the RPM display.

1. Enter the password code 1111. (Refer to Programming Section.)
   Result: When the correct password code is entered C 3 flashes in the RPM display. The message display shows CAL. ENG RPM.

2. Press the SCROLL up or down buttons when the program (C) code is flashing to scroll through the program codes.
   Refer to specific calibration section for detailed procedures.

Note: If there is a failure during calibration the message display shows SENSOR PROBLEM.

3. Press the SILENCE button when the program (C) code is flashing to exit.

Table 3. Calibration Codes Quick Reference Chart

<table>
<thead>
<tr>
<th>CODE</th>
<th>DESCRIPTION</th>
<th>MESSAGE DISPLAY</th>
<th>Press MENU Button Again</th>
<th>Press MENU Button Again</th>
</tr>
</thead>
<tbody>
<tr>
<td>C3</td>
<td>Engine RPM Calibration</td>
<td>CAL. ENG RPM</td>
<td>SET RPM XXXX</td>
<td></td>
</tr>
</tbody>
</table>
Engine RPM (Code C3)

This code is not applicable for engines with the J1939 CAN connected. To perform the following calibration, a reference tachometer is needed to verify the correct engine RPM.

1. Apply power to the display module.
2. Enter the calibration password.
3. Scroll to code C3  CAL. ENG RPM.
4. Press the MENU button to show SET RPM.
   Result: Flashing digit is ready to be changed.
5. Set the RPM to match the reference RPM. Press the SCROLL up or down buttons to change the value. Press the MENU button to change the digit.
6. Press the SILENCE button to save the setting into memory.
7. Press the SILENCE button when the program (C) code is flashing to exit calibration. Press the MENU button to enter the next program. Press the SCROLL up or down buttons to scroll through program codes.
The following figures include the schematics, wiring diagrams, block diagrams, and cables for the ThrottleXcel.

Connectors and Cables

For most engines the throttle display receives engine RPM, oil pressure, and coolant temperature data over the J1939 data link from the ECM. Some engines do not broadcast this data over the data link and sensors may need to be installed.

When the GOVERNOR CONTROL MODE is programmed with Cummins, Detroit Diesel, and Mercedes engines, the governor is designed to control engine throttle directly over the SAE J1939 databus. Remote throttle does not need to be enabled in the ECM and remote throttle wiring is not needed.
### 8 Pin Connector/Cable

<table>
<thead>
<tr>
<th>Pin</th>
<th>Wire Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Red</td>
<td>Supply Voltage (12/24 VDC)</td>
</tr>
<tr>
<td>2</td>
<td>Black</td>
<td>Ground</td>
</tr>
<tr>
<td>3</td>
<td>Orange</td>
<td>+5 VDC Reference From ECM</td>
</tr>
<tr>
<td>4</td>
<td>White</td>
<td>Throttle Signal To ECM</td>
</tr>
<tr>
<td>5</td>
<td>Green</td>
<td>Signal Return From ECM</td>
</tr>
<tr>
<td>6</td>
<td>Yellow</td>
<td>Interlock Input (+VDC)</td>
</tr>
<tr>
<td>7</td>
<td>Blue</td>
<td>Throttle Enable Signal Output</td>
</tr>
<tr>
<td>8</td>
<td>Brown</td>
<td>Foot Pedal Signal Input</td>
</tr>
</tbody>
</table>

**Notes:**
- Not all wires are used for all engines. Refer to the engine specific wiring diagram for interface connections.
- An adapter and cable assembly replaces the basic 8-pin cable when connecting the ThrottleXcel to a Ford 6.0 or 6.4 engines. Refer to the engine specific wiring diagram.

### 12 Pin Connector/Cable

<table>
<thead>
<tr>
<th>Pin</th>
<th>Wire Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Red</td>
<td>Supply Voltage (12/24 VDC)</td>
</tr>
<tr>
<td>2</td>
<td>Black</td>
<td>Ground</td>
</tr>
<tr>
<td>3</td>
<td>Orange</td>
<td>+5 VDC Reference From ECM</td>
</tr>
<tr>
<td>4</td>
<td>White</td>
<td>J1939 CAN (Shield)</td>
</tr>
<tr>
<td>5</td>
<td>Green</td>
<td>J1939 CAN (–)</td>
</tr>
<tr>
<td>6</td>
<td>Red</td>
<td>J1939 CAN (+)</td>
</tr>
<tr>
<td>7</td>
<td>Yellow</td>
<td>RPM Signal</td>
</tr>
<tr>
<td>8</td>
<td>Brown</td>
<td>Engine Oil Press. Sensor Signal</td>
</tr>
<tr>
<td>9</td>
<td>Orange</td>
<td>Engine Temp. Sensor Signal</td>
</tr>
<tr>
<td>10</td>
<td>Brown</td>
<td>Buzzer Ground (300mA)</td>
</tr>
<tr>
<td>11</td>
<td>Yellow</td>
<td>High Idle Active Input (+VDC)</td>
</tr>
<tr>
<td>12</td>
<td>Brown</td>
<td>Foot Pedal Signal Input</td>
</tr>
</tbody>
</table>

**Notes:**
- Not all wires are used for all engines.
- For Ford 6.0L, 6.4L engines the yellow RPM signal wire, pin 12, should be connected to the Clean Tachometer Output [for 6.0L green/white wire, circuit #76] [for 6.4L dark blue wire]. For 2011 6.7L engines the J1939 Translator Module needs to be installed.
- High idle is not available for Ford or Mack.
- The J1939 CAN bus is terminated with a 120 ohm resistor.
- When using an FRC provided engine sensor cable, the red wire is sensor signal and the black wire connects to a ground.

### 6 Pin Connector/Cable

<table>
<thead>
<tr>
<th>Pin</th>
<th>Wire Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NC</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>NC</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>NC</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Green</td>
<td>FRC Datalink (–)</td>
</tr>
<tr>
<td>5</td>
<td>Yellow</td>
<td>FRC Datalink (+)</td>
</tr>
<tr>
<td>6</td>
<td>NC</td>
<td></td>
</tr>
</tbody>
</table>
Cummins Harness Connections

Interface Information

The ECM Remote Accelerator (Throttle) Option has to be set to ON. The diagnostic tool cannot be used to do this, an Insight service tool must be used. Refer to an authorized dealer to program this option.

Figure 5. Cummins ELA201 Wiring
Detroit Diesel Harness Connections

THROTTLE CONTROL MODE

Interface Information

**Vehicle Interface Harness**

**DDEC V**
- V-43
- V-44
- V-58

**DDEC VI**
- 2/18 J1939 CAN (+)
- 2/17 SHIELD
- 2/16 J1939 CAN (–)

**8-Pin Connector** (Refer to Figure 4)
- Pin 10 Red Wire
- Pin 8 White Wire
- Pin 9 Black Wire

**2007 and Newer Engine**
- DDEC VI
- Vehicle Interface Harness
- DO NOT WIRE FOR GOVERNOR CONTROL MODE

**2006 and Older Engine**
- DDEC V
- Vehicle Interface Harness

**Remote Throttle Select Switch**
- 2/8
- 2/9

**Remote PTO Switch**
- 3/3
- 3/4
- 3/2

**Sensor Supply**
- J1939 (+)
- Shield
- J1939 (–)

**ECM**
- Yel/Red
- Ppl/Yel
- Yel/Blk

**Variable Speed Governor**
- Sensor Supply (5 VDC)

**Sensor Return**

Figure 6. Detroit Diesel ELA202 Wiring
**Governor Control Mode**

This wiring is for use **ONLY** when the ThrottleXcel is programmed for the **GOVERNOR CONTROL MODE**.

### 12-Pin Connector (Refer to Figure 4)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Color</th>
<th>J1939 Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Red Wire</td>
<td>Dk Blu Red</td>
<td>J1939 (+)</td>
</tr>
<tr>
<td>8 White Wire</td>
<td>Dk Blu Yel</td>
<td>Shield</td>
</tr>
<tr>
<td>9 Black Wire</td>
<td>Dk Blu</td>
<td>J1939 (-)</td>
</tr>
</tbody>
</table>

### Vehicle Interface Harness

- **DDEC V**
  - V-43: 2/18 J1939 CAN (+)
  - V-44: 2/17 SHIELD
  - V-58: 2/16 J1939 CAN (-)

- **DDEC VI**
  - 18-PIN CAN (+)

**Figure 7. Detroit Diesel ELA202 Wiring Governor Control Mode**
Navistar Harness Connections

Interface Information

The ECM must be programmed for a remote throttle input. When using code or 12VXY, 12VZA, or 12VZB the following parameters need to be set:

PTO-REMOTE-PEDAL to 1-Yes; PTO-REM-PEDAL-RTZ to 1-RTZ-not;
PTO-DISABLE-CAB-INTERFACE to 1-Yes; DRIVELINE-MODE to 1

Note: Check the engine code to verify the program setting (for J1939 control use 4C and for voltage control use 4D). Wire accordingly or change the code.

J1939 CAN Bus Control 12VXY
2010 and Newer MAXXFORCE 11 and 13 Engines

This wiring is for use ONLY when the ThrottleXcel is programmed for the GOVERNOR CONTROL MODE

Voltage Control
Post 2007 MAXXFORCE 7, DT, 9, 10, 11, and 13 Engines

8-Pin Connect (Refer to Figure 4)

ECM Function

Voltage Ref 5V
REM Accelerator
Signal Return
Variable PTO Enable
Transfer Case

Figure 8. Navistar ELA204 Wiring

27
Navistar / International Chassis Harness Connections

Interface Information

**Note:** This function is not available on custom chassis, refer to Figure 8.

Navistar ELA Wiring.

Vehicles must be equipped with an Electronic System Controller (ESC) and have the Body Builder J1939 Datalink available.

Remote Engine Speed must be set to ON (Feature Code 0595AHA)

Connect the Body Builder J1939 Datalink to the FRC Datalink for engine control as shown below.

This wiring is for use **ONLY** when the ThrottleXcel is programmed for the **GOVERNOR CONTROL MODE**.

---

**Figure 9. Navistar/International Chassis ELA204 Wiring**

---
Caterpillar Harness Connections

Interface Information

The parameter settings for PTO Configuration is programmed to Remote Throttle or Remote Throttle with J1939 Speed Command.

ECM software with a Personality Module release date of May08 for C7, C9, C13, C15 engines, has the Remote Throttle with J1939 Speed Command setting available. This setting allows the engine speed to be controlled during PTO operations by a J1939 compliant device.

Refer to an authorized dealer to program one of these options.

C7, C9, C10, C11, C12, C13, C15 Engine Interface

Engines with 70-pin OEM connector.

Figure 10. Caterpillar ELA205 Wiring (Sheet 1 of 2)
C10. C12 Engine Interface

Engines with 40-Pin OEM connector.

Note: Refer to 12-Pin connector Figure 4 for separate sensor and RPM connections.
Ford Harness Connections

2011 Model F-250/350/450/550 - 6.7L Diesel Engines

J1939 Interface Information

A J1939 CAN input is required to provide engine information to the ThrottleXcel. The Ford vehicle CAN Bus information needs to be interpreted. A J1939 Translator Module with a harness to connect it to the ODB-II connector must be installed.

**Note:** The ODB-II connector and wiring is accessed under the dash.  
There are two scenarios:

I. The J1939 Translator Module is installed as a component with governor kit (no Seat Belt Monitoring System is installed).

   Install the J1939 Translator Module and the ODB-II interconnecting harness (provided with the throttle kit). A 2-Pin connector is provided for the wires to ThrottleXcel.

II. The J1939 Translator Module is installed as part of the NFPA1901 compliant Seat Belt Monitoring and VDR System.

   The Translator Module/ODB-II/VDR harness is under the driver side dash. A T-cable (provided with the governor kit) needs to be installed at the 4-Pin connector that is between the harness and the VDR.

Stationary Elevated Idle Control (SEIC) Interface Information

**Note:** Access wires for SEIC are located in cabin, tagged and bundled above the parking brake pedal assembly behind datalink connector.

SEIC is used in two modes: stationary and split shaft. The ThrottleXcel provides a variable RPM control to the Ford Power train Control Module (PCM) when all enabling conditions are met. Refer to Figure 13 Ford 6.7L ELA PCM Wiring.

**SEIC Enablers:** Parking brake applied; Foot off of service brake; Vehicle in park; Foot off of accelerator pedal; Vehicle speed is 0 mph (stationary); Engine at a stable base idle speed.

**Note:** Do not press the accelerator or service brake pedal when engaging the fire pump, this prevents the switch into SEIC.
Install the J1939 Translator Module with the ODB-II Interconnecting Harness or Install the T-cable between 4-Pin connectors.

To install the J1939 Translator Module with ODB-II harness, read and follow the installation instructions provided with the Translator Module kit.

**Note:** The TEST pad on the module circuit board has to be held at ground when the harness connector is plugged into the J1 connector.

---

**J1939 Translator Module Harness**

- **To OEM ODB-II Connector**
  - Pass Through ODB-II Connector
  - 2-Pin Connector:
    - 1-Red J1939 (+)
    - 2-Blk J1939 (–)
  - To Translator Module J1 Connector
  - To ThrottleXcel 2-Pin Connector

---

**J1939 Translator Module and VDR Harness**

- **To OEM ODB-II Connector**
  - Pass Through ODB-II Connector
  - 2-Pin Connector:
    - 1-Red J1939 (+)
    - 2-Blk J1939 (–)
  - 4-Pin VDR Connector
  - To FRC VDR 8-Pin Connector
  - To ThrottleXcel 12-Pin Connector
  - Disconnect VDR harness 4-Pin connector and connect the T-cable provided with the governor kit.

---

**Translator Module Harness to Governor**

- **ELA 12-Pin Connector**
  - Pin 10 Red Wire: J1939 (+)
  - Pin 9 Black Wire: J1939 (–)

**Note:** Refer to Figure 4. Connector Wiring for ThrottleXcel power and interlock wire connections.

---

**Figure 11. Ford 6.7L ELA206 J1939 Translator Module Wiring**
2011 Model F-250/350/450/550 - 6.7L Diesel Engine
Stationary Elevated Idle Control (SEIC)

Note: Do not press the accelerator or service brake pedal when engaging the fire pump, this prevents the switch into SEIC.

Note: Refer to Figure 4. Connector Wiring for power and interlock wire connections.

Access wires for SEIC are located in cabin, tagged and bundled above the parking brake pedal assembly behind datalink connector.

### Stationary Mode

| Pin 3 Orange Wire | LE434 | 55 | PTO REF |
| Pin 5 Green Wire | RE327 | 22 | PTO RTN |
| Pin 4 White Wire | CE914 | 8  | PTO RPM |
| +12 (24) VDC Pump in Gear | CE912 | 6  | PTO RS1 |

### Split Shaft Mode

| Pin 3 Orange Wire | LE434 | 55 | PTO REF |
| Pin 5 Green Wire | RE327 | 22 | PTO RTN |
| Pin 4 White Wire | CE914 | 8  | PTO RPM |
| +12 (24) VDC Pump in Gear | CE912 | 6  | PTO RS1 |

| | CE933 | 4  | PTO RS2 |

Split Shaft Mode is activated by applying supply voltage to both the PTORS1 and PTORS2 PCM circuits simultaneously.

1. Assure engine is running and fully warmed-up.
2. Apply parking brake.
3. Transmission in neutral to disengage drive wheels.
4. **With foot off brake and accelerator**, switch Split-Shaft PTO on.
5. **Without pressing the brake, shift transmission into drive.** If vehicle unexpectedly lurches or moves, immediately press brake pedal and shift transmission into park or neutral to secure vehicle.

Once the system enablers are met voltage may be added to the SEIC system for activation.

If power is applied prior to the enablers being met, a system error may occur, and the SEIC system will have to be reset.

If an SEIC disabler occurs the engine requires a change-of-state, meaning the operator is required to turn off voltage to the PTO-Request circuit, and back on again to re-invoke SEIC and PTO operation.
Mack Harness Connections

Interface Information

The 8-Pin cable needs to be wired to the cab foot throttle harness. Use a voltmeter to determine which pins are 5 V Reference and Engine Control Signal.

The engine control signal will be 0.7 volts at idle and rise to approximately 3.8 volts as the foot pedal is pressed.

Note: Refer to 12-Pin connector Figure 4 for separate sensor and RPM connections.

Figure 13. Mack ELA207 Wiring

V-MAC IV with IVS switch in the foot throttle

Note: Use a plug and receptacle on the Engine Control Signal wire so the ends can be reconnected if the ThrottleXcel is removed.
**Governor Control Mode**

This wiring is for use **ONLY** when the ThrottleXcel is programmed for the **GOVERNOR CONTROL MODE**.

For V-MACK IV 07 and newer, the governor is designed to control engine throttle directly over the SAE J1939 databus.

---

**J1939 CAN Bus Control**

<table>
<thead>
<tr>
<th>12-Pin Connector (Refer to Figure 5)</th>
<th>Pin 9 Black Wire</th>
<th>J1939 (−)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 10 Red Wire</td>
<td></td>
<td>J1939 (+)</td>
</tr>
</tbody>
</table>

VECUC
Connector C

VC5
VC4

---

**Figure 14. Mack ELA207 Wiring Governor Control Mode**
Scania Harness Connections

Interface Information

For use on P, R, and T-series trucks equipped with a bodywork control unit (BWS). Connector C259 is available on all vehicles ordered with any of the bodywork options. It is located on the plate for the electrical bodywork interface for body builders. Connector C259 is white and has 21 pins. (February 2005 and newer.)

The EXT switch must be in the ON position when operating the throttle.

Figure 15. Scania ELA208 Wiring

| Pin 10 Red Wire | J1939 CAN high | 21 |
| Pin 9 Black Wire | J1939 CAN low | 20 |
| Pin 3 Orange Wire | Engine RPM Control 2 +5 Volts | 11 |
| Pin 4 White Wire | Engine RPM Control 2 Signal | 10 |
| Pin 5 Green Wire | Engine RPM Control 2 Earth | 9 |
| Pin 7 Blue Wire | Engine RPM Control 2 +24 Volts | 8 |

Note: Signal to pin10 is 0.6 to 3.0 V
Mercedes Harness Connections

Interface Information.

12-Pin Connector (Refer to Figure 4)
- Pin 10 Red Wire
- Pin 8 White Wire
- Pin 9 Black Wire

8-Pin Connector (Refer to Figure 4)
- 1 RED
- 2 BLK
- 3 ORG
- 4 WHT
- 5 GRN
- 6 YEL
- 7 BLU
- 8 BRN

12-Pin Connector (Refer to Figure 4)
- Pin 8 White Wire
- Pin 9 Black Wire
- Pin 10 Red Wire

DDEC VI Vehicle Interface Harness
18-PIN Connector #2
- 2/18 J1939 CAN (+)
- 2/17 SHIELD
- 2/16 J1939 CAN (–)

2007 and Newer Engine
DDEC VI Vehicle Interface Harness
- Remote Throttle Select Switch
- Sensor Supply
- Remote PTO Switch
- Sensor Return
- 2/18 Ignition Key +12 (24) VDC
- 2/17 Pump Engaged Interlock

2006 and Older Connectors

21-PIN Connector #3
- 3/3 Sensor Supply
- 3/4 Remote PTO
- 3/2 Sensor Return

VCU 18-PIN Connector
- 18 Remote Throttle Signal Analog
- 17 Remote PTO Power Supply
- 7 Remote Accel Select Sw
- 10 Remote PTO Sw

VCU 21-PIN Connector
- 14 Sensor Ground (Throttle Pedal & Remote)
- 20 Shield
- 21 – J1939
- 19 + J1939

Figure 16. Mercedes ELA210 Wiring
**John Deere Harness Connections**

**Interface Information**

CAN Controller will request a torque by means of TSC1. This option is disabled by default and is selectable in the Trim Options page for this application. Source address 57 should be programmed.

**Note:** Refer to Figure 4 Connector Wiring for Power and Interlock wire connections.

---

**J1939 CAN Bus Control**

<table>
<thead>
<tr>
<th>12-Pin Connector (Refer to Figure 4)</th>
<th>Pin 9 Black Wire</th>
<th>Circuit No. 905 Green</th>
<th>J1939 (−)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 10 Red Wire</td>
<td></td>
<td>Circuit No. 904 Yellow</td>
<td>J1939 (+)</td>
</tr>
</tbody>
</table>

TIER-3 PowerTech Engines

21 Pin Deutsch Connector

---

Figure 17. John Deere ELA216 Wiring
MAN Harness Connections

Interface Information

Parameters for various functions can be set on the KSM using MAN-cats II.

The KSM can accept the Engine speed request from the Governor on the A-CAN.

Note: Refer to Figure 4 Connector Wiring for Power and Interlock wire connections.

J1939 CAN Bus Control

12-Pin Connector (Refer to Figure 4)  
Pin 9 Black Wire  
Pin 10 Red Wire

18-Pin Connector X1997

Brown-Orange/0.75 A-CAN-L  J1939 (−) X1997/18

Orange/0.75 A-CAN-H  J1939 (+) X1997/17
**High-Idle Wiring**

The throttle programming includes a high-idle function. To activate the high-idle provide $+ \text{VDC}$ to pin 7 (High-Idle Active Input) of the 12-pin connector and pin 6 (Interlock Input) of the 8-pin connector. The high-idle connection to pin 6 must be isolated from the interlock circuit using two diodes (see schematic).

**Note:** It is important that the connection to the Interlock Input from the High-Idle circuit be isolated from the apparatus interlock wiring with the two diodes. Refer to the wiring diagram. **The pump must NOT be engaged when using the high idle function.**

The high-idle is set at about 1000 RPM at the factory. (This value will vary depending on the specific engine.) To adjust this setting refer to High-Idle in the Operation Section.

A High-Idle Kit is available from FRC.
Includes:
- **ON/OFF Switch**
- **Indicator Light**
- Two Diodes

![Figure 19. High-Idle Wiring](image-url)
It is good engineering practice to include a flyback diode when switching an inductive load (solenoid coil, relay coil, electric motor winding, etc.). It is recommended that a flyback diode be installed on inductive devices that share a common power source/ground with a FRC throttle display.

Typical circuit showing a flyback diode installed across an inductive load.

Diagram showing a flyback diode connected on a typical pump primer motor solenoid.
DANGER

PERSONAL RESPONSIBILITY CODE

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1. Firefighting and Emergency Response are inherently dangerous activities requiring proper training in their hazards and the use of extreme caution at all times.

2. It is your responsibility to read and understand any user’s instructions, including purpose and limitations, provided with any piece of equipment you may be called upon to use.

3. It is your responsibility to know that you have been properly trained in Firefighting and/or Emergency Response and in the use, precautions, and care of any equipment you may be called upon to use.

4. It is your responsibility to be in proper physical condition and to maintain the personal skill level required to operate any equipment you may be called upon to use.

5. It is your responsibility to know that your equipment is in operable condition and has been maintained in accordance with the manufacturer’s instructions.

6. Failure to follow these guidelines may result in death, burns or other severe injury.

FEMSA

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